Uncertainty assessment of climate change adaptation using an economic pluvial flood risk framework

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Uncertainty assessment of climate change adaptation using an economic pluvial flood risk framework

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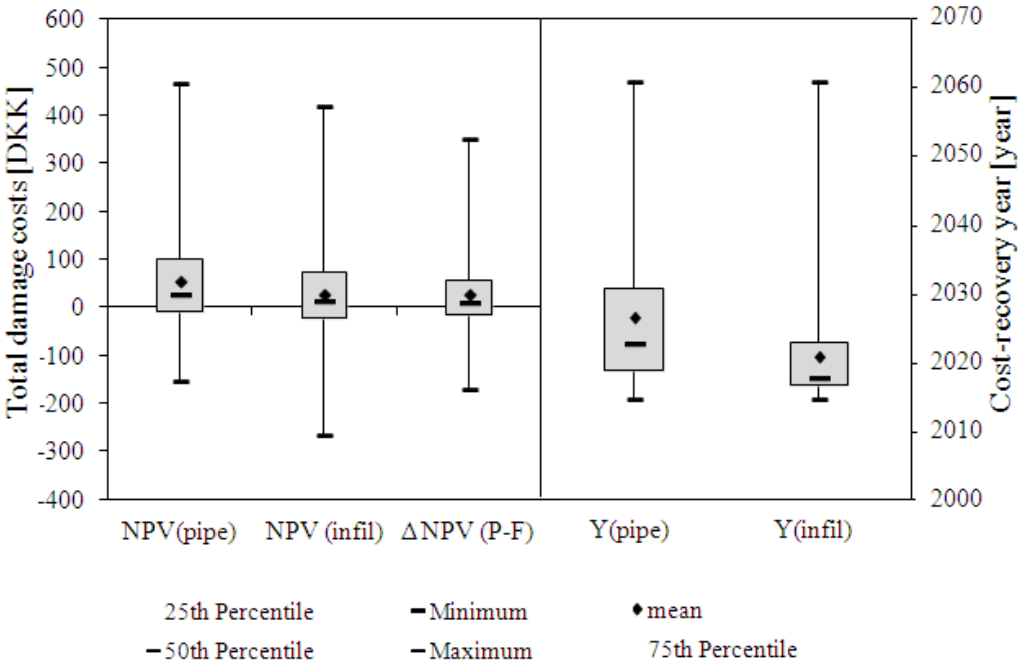
Abstract
It is anticipated that climate change is likely to lead to an increasing risk level of flooding in cities in northern Europe. One challenging question is how to best address the increasing flood risk and assess the costs and benefits of adapting to such changes. We established an integrated approach for identification and assessment of climate change adaptation options by incorporating climate change impacts, flood inundation modelling, economic tool and risk assessment and management. The framework is further extended and adapted by embedding a Monte Carlo simulation to estimate the total uncertainty bounds propagated through the evaluation and identify the relative contribution of inherent uncertainties in the assessment. The case study is a small urban catchment located in Skibhus, Odense where no significant city development is anticipated. Two adaptation scenarios, namely pipe enlargement and local infiltrations, are compared to a business-as-usual scenario. The results show that the framework has the capacity to assess the overall efficiency of different adaptation options. Although uncertainties associated with the evaluation are very high it is still possible to identify a robust adaptation option on a basis of assessed economic indicators, e.g. net benefits (NPV), cost-recovery period (Y) and the difference in calculated net benefits (ΔNPV) when comparing two adaptation alternatives. Pipe enlargement turned out to be more economically beneficial in comparison to local infiltration in this study, see Figure 1. The sensitivity analysis indicates the input runoff volumes and damage estimation are of high importance to the overall uncertainty. This gives a good indication of how further efforts (e.g. field data collection, modelling calibration) can be prioritised to reduce the overall uncertainty bounds.



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